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(54) Title: MULTI-LAYER FUEL- AND VAPOR TUBE COMPRISING POLYPHTHALAMIDE

(57) Abstract: The invention is concerned with multilayer tubes for use in a vehicle, containing at least one Polyphthalamide-layer, which can be used as fuel or vapor tube in a vehicle.

Title: Multi-layer fuel- and vapor tube comprising Polypythalamide

Description

5

The invention is concerned with multilayer tubes for use in a motor-vehicle.

10 Large strains (e.g. bending, elongation) are expected against fuel lines and therefore high technical standards are required.

15 In the state of the art fuel and vapor tubes consisting of polyamides are described. It is increasingly important, that the used tubes are essentially impermissible against fluid emissions (e.g. hydrocarbons in fuels).

20 Thus a hydrocarbon permission level for such a tube of equal or below 0,5 g/m² for a time frame of 24 h (1 d) is required. Furthermore, it is required, that the used fuel tubes do not have interactions with existing materials within the fuel, like oxidants, detergents, tensides and additives (e.g. ethanol, methanol, etc.)

25 Moreover penetration of fluids may lead to crystallisation of tubing material (e.g. when using Nylon 11, Nylon 12, in particular in presence of copper ions) and blocking of the tube.

30 For those reasons multilayer tubes are of particular interest. However, it is difficult to obtain satisfactory laminate characteristics between dissimilar polymeres, as given in the case of a multilayer tube.

35 Particulary one object of the invention is to provide a novel barrier layer having stable carrier characteristics in the frame of multilayer tubes.

The object is solved by a multilayer tube having the features of claim 1, in particular a multilayer tube comprising at least one Polyphthalamide layer, being used as fuel- or vapor tube. Further embodiments result from the appropriate sub-
5 claims.

According to the invention the term „tube“ is to be understood as a functional synonym or equivalent corresponding to "hose" or "line".

10 "Multilayer tube" means a tube consisting of at least two layers. More preferably the tube consists of three and more layers, most preferably 3 - 5 or 6 layers (cf. embodiments in detail below); further layers are also possible.

15 According to the present invention at least one Polyphthalamide (in short: PPA) layer is a suitable barrier layer of the tube, preferably comprising one or more Polyamide layer.

20 If necessary in combination with a bonding layer, preferably selected from a polyamide.

25 Polyamides are preferably selected from the group consisting of 6,6-Polyamide (in short: PA 6), 11,11-Polyamide (in short: PA 11), 12,12-Polyamide (in short: PA 12), Copolymer derived from 6,6-Polyamide and 12,12-Polyamide (in short: PA 6/12).

30 Layers consisting of Polyethylene (in short: PE) or Polypropylene (in short: PP) or a Copolymer thereof may also contain.

Moreover, PPA layer(s) thinner than other layers, in particular Polyamide layers, are preferred.

35 In a further preferred embodiment according to the invention the outer layer and/or inner layer consists of PPA. This

depends on the fact, that embodiments having PPA - intermediate layer exhibit less laminate characteristics than those embodiments comprising PPA- inner and / or outer layer.

5 A further embodiment relates to a multilayer tube according to the invention, wherein at least one layer, in fact PPA- or PA-layer is conductible.

The conductibility of the tube may be provided for example (non-complete listing) by the means of surcharges of carbon 10 (also carbon black) or metals (Cu, Si, Ag, Au, Ni etc.).

In the following such a conductive layer is denoted as PPA cond. or PA cond..

15 The multilayer tubes prove to be stable and strainable, also respectively bending and elongation under maintenance of the laminate characteristics.

Hence, an especial embodiment concerns a multilayer tubing, 20 comprising at least one PPA-layer and at least one Polyamide, non-completing selected from the group having the layers:

PPA - PA 6 - PA 6/12 (bonding agent) - PA 12,

PPA - PA 6 - PA 6/12 (bonding agent) - PPA,

25 PPA - PA 6/12 (bonding agent) - PA 12,

PA 6 - PPA - PA 6,

PA 12 - PPA - PA 12,

PPA - PA 6 (bonding agent) - PPA,

PPA cond. - PPA - PA 6 (bonding agent) - PPA.

30

(notation from inner layer - outer layer)

Within this group, embodiments having PPA as outer and / or inner layer are prefered.

Most advantegous are the high temperature resistance, chemical inert properties, flexibility of the performance, good adhesion.

5 Especially advantageous are the high temperature constancy, chemical inertness, flexibility of tubes, as well as good layer adhesion as well as good permeation constancy.

10 In contrast to pure polyamide tubes a temperature constancy of up to 140° Celsius can be achieved.

The multilayer tubes according to the invention can be used for all types of conventional fuel and petrol or vapors (including gases) and are obtainable in every desired length and thickness (diameter as well as wall thickness).

15 The tube materials mentioned in this context are exclusively materials that can be commercially acquired in trade. The tube materials indicated are all easily extrudable, if necessary co-extrudable and easily accessible to fusion
20 processing as thermoplastic materials. The layers adhere to one another due to permanent laminar adhesion, if necessary supported by means of a bonding agent or an adhesive (e.g. glue as well). All embodiments of the multilayer tubes as per the invention can be manufactured by the person skilled in
25 the art in a known manner.

In a further embodiment the layers can contain additions, i.e. the usual softeners, flame restraints and anti-oxidation means or stabilising agents.

30 The multiplayer tubes as per the layer in question can optionally contain an outer cover, which e. g. consists of a adequate thermoplastic suitable for fusion processing, which is either co-extruded or attached, for the purpose of an
35 additional isolation (protection). Furthermore, this layer may be able to lead off electrostatic energy. According to

the invention such an outer cover shall be not read as a synonym for outer layer.

Furthermore the invention, and not finally, is concerned
5 with such conductive and non-conductive layer combinations as follows, wherein the term "BA" designates "Bonding agent" (adhesive) :

Nicht leitfähig / Non conductive

PPA	PE	
PPA	PP	
PPA	PA 6	
PPA	PA 11	
PPA	PA 12	
PE	PPA	
PP	PPA	
PA 6	PPA	
PA 11	PPA	
PA 12	PPA	
PPA	BA	PPA
PPA	BA	PE
PPA	BA	PP
PPA	BA	PA 6
PPA	BA	PA 11
PPA	BA	PA 12
PE	BA	PPA
PP	BA	PPA
PA 6	BA	PPA
PA 11	BA	PPA
PA 12	BA	PPA
PPA	PA 6/12	PPA
PPA	PA 6/12	PE
PPA	PA 6/12	PP
PPA	PA 6/12	PA 6
PPA	PA 6/12	PA 11
PPA	PA 6/12	PA 12

PE	PA 6/12	PPA
PP	PA 6/12	PPA
PA 6	PA 6/12	PPA
PA 11	PA 6/12	PPA
PA 12	PA 6/12	PPA
PE	PPA	PE
PP	PPA	PP
PA 6	PPA	PA 6
PA 11	PPA	PA 11
PA 12	PPA	PA 12
PE	PPA	PP
PE	PPA	PA 6
PE	PPA	PA 11
PE	PPA	PA 12
PP	PPA	PE
PA 6	PPA	PE
PA 11	PPA	PE
PA 12	PPA	PE
PP	PPA	PA 6
PP	PPA	PA 11
PP	PPA	PA 12
PA 6	PPA	PP
PA 11	PPA	PP
PA 12	PPA	PP
PA 6	PPA	PA 11
PA 6	PPA	PA 12
PA 11	PPA	PA 6
PA 12	PPA	PA 6
PA 11	PPA	PA 12
PA 12	PPA	PA 11
PE	BA	PPA
PP	BA	PPA
PA 6	BA	PPA
PA 11	BA	PPA
PA 12	BA	PPA
PE	PA 6/12	PPA
		PE

PP	PA 6/12	PPA	PP
PA 6	PA 6/12	PPA	PA 6
PA 11	PA 6/12	PPA	PA 11
PA 12	PA 6/12	PPA	PA 12
PE	PPA	BA	PE
PP	PPA	BA	PP
PA 6	PPA	BA	PA 6
PA 11	PPA	BA	PA 11
PA 12	PPA	BA	PA 12
PE	PPA	PA 6/12	PE
PP	PPA	PA 6/12	PP
PA 6	PPA	PA 6/12	PA 6
PA 11	PPA	PA 6/12	PA 11
PA 12	PPA	PA 6/12	PA 12
PPA	PE	BA	PPA
PPA	PE	BA	PE
PPA	PP	BA	PP
PPA	PA 6	BA	PA 6
PPA	PA 11	BA	PA 11
PPA	PA 12	BA	PA 12
PPA	PE	PA 6/12	PPA
PPA	PE	PA 6/12	PE
PPA	PP	PA 6/12	PP
PPA	PA 6	PA 6/12	PA 6
PPA	PA 11	PA 6/12	PA 11
PPA	PA 12	PA 6/12	PA 12
PPA	BA	PA 6/12	PPA
PPA	BA	PA 6/12	PE
PPA	BA	PA 6/12	PP
PPA	BA	PA 6/12	PA 6
PPA	BA	PA 6/12	PA 11
PPA	BA	PA 6/12	PA 12
PE	BA	PA 6/12	PPA
PP	BA	PA 6/12	PPA
PA 6	BA	PA 6/12	PPA
PA 11	BA	PA 6/12	PPA

PA 12	BA	PA 6/12	BA	PPA
PPA	PA 6	PA 6/12	BA	PPA
PPA	PA 6	PA 6/12	BA	PE
PPA	PA 6	PA 6/12	BA	PP
PPA	PA 6	PA 6/12	BA	PA 6
PPA	PA 6	PA 6/12	BA	PA 11
PPA	PA 6	PA 6/12	BA	PA 12
PPA	PA 11	PA 6/12	BA	PPA
PPA	PA 11	PA 6/12	BA	PE
PPA	PA 11	PA 6/12	BA	PP
PPA	PA 11	PA 6/12	BA	PA 6
PPA	PA 11	PA 6/12	BA	PA 11
PPA	PA 11	PA 6/12	BA	PA 12
PPA	PA 12	PA 6/12	BA	PPA
PPA	PA 12	PA 6/12	BA	PE
PPA	PA 12	PA 6/12	BA	PP
PPA	PA 12	PA 6/12	BA	PA 6
PPA	PA 12	PA 6/12	BA	PA 11
PPA	PA 12	PA 6/12	BA	PA 12
PA 6	PPA	PA 6/12	BA	PE
PA 6	PPA	PA 6/12	BA	PP
PA 6	PPA	PA 6/12	BA	PA 6
PA 6	PPA	PA 6/12	BA	PA 11
PA 6	PPA	PA 6/12	BA	PA 12
PA 11	PPA	PA 6/12	BA	PE
PA 11	PPA	PA 6/12	BA	PP
PA 11	PPA	PA 6/12	BA	PA 6
PA 11	PPA	PA 6/12	BA	PA 11
PA 11	PPA	PA 6/12	BA	PA 12
PA 12	PPA	PA 6/12	BA	PE
PA 12	PPA	PA 6/12	BA	PP
PA 12	PPA	PA 6/12	BA	PA 6
PA 12	PPA	PA 6/12	BA	PA 11
PA 12	PPA	PA 6/12	BA	PA 12
PA 6	PA 6/12	PPA	BA	PE
PA 6	PA 6/12	PPA	BA	PP

PA 6	PA 6/12	PPA	BA	PA 6
PA 6	PA 6/12	PPA	BA	PA 11
PA 6	PA 6/12	PPA	BA	PA 12
PA 11	PA 6/12	PPA	BA	PE
PA 11	PA 6/12	PPA	BA	PP
PA 11	PA 6/12	PPA	BA	PA 6
PA 11	PA 6/12	PPA	BA	PA 11
PA 11	PA 6/12	PPA	BA	PA 12
PA 12	PA 6/12	PPA	BA	PE
PA 12	PA 6/12	PPA	BA	PP
PA 12	PA 6/12	PPA	BA	PA 6
PA 12	PA 6/12	PPA	BA	PA 11
PA 12	PA 6/12	PPA	BA	PA 12
PA 6	PA 6/12	PE	BA	PPA
PA 6	PA 6/12	PP	BA	PPA
PA 6	PA 6/12	PA 6	BA	PPA
PA 6	PA 6/12	PA 11	BA	PPA
PA 6	PA 6/12	PA 12	BA	PPA
PA 11	PA 6/12	PE	BA	PPA
PA 11	PA 6/12	PP	BA	PPA
PA 11	PA 6/12	PA 6	BA	PPA
PA 11	PA 6/12	PA 11	BA	PPA
PA 11	PA 6/12	PA 12	BA	PPA
PA 12	PA 6/12	PE	BA	PPA
PA 12	PA 6/12	PP	BA	PPA
PA 12	PA 6/12	PA 6	BA	PPA
PA 12	PA 6/12	PA 11	BA	PPA
PA 12	PA 6/12	PA 12	BA	PPA

Or:

leitfähig/conductive (cond.)

Von Innen / Inner layer	Nach Außen /	Outer layer
PPA cond		PPA
PPA cond	PPA	PE

PPA cond	PPA	PP	
PPA cond	PPA	PA 6	
PPA cond	PPA	PA 11	
PPA cond	PPA	PA 12	
PPA cond	PE	PPA	
PPA cond	PP	PPA	
PPA cond	PA 6	PPA	
PPA cond	PA 11	PPA	
PA cond	PA 12	PPA	
PPA cond	PPA	BA	PPA
PPA cond	PPA	BA	PE
PPA cond	PPA	BA	PP
PPA cond	PPA	BA	PA 6
PPA cond	PPA	BA	PA 11
PPA cond	PPA	BA	PA 12
PPA cond	PE	BA	PPA
PPA cond	PP	BA	PPA
PPA cond	PA 6	BA	PPA
PPA cond	PA 11	BA	PPA
PA cond	PA 12	BA	PPA
PPA cond	PPA	PA 6/12	PPA
PPA cond	PPA	PA 6/12	PE
PPA cond	PPA	PA 6/12	PP
PPA cond	PPA	PA 6/12	PA 6
PPA cond	PPA	PA 6/12	PA 11
PPA cond	PPA	PA 6/12	PA 12
PPA cond	PE	PA 6/12	PPA
PPA cond	PP	PA 6/12	PPA
PPA cond	PA 6	PA 6/12	PPA
PPA cond	PA 11	PA 6/12	PPA
PA cond	PA 12	PA 6/12	PPA
PPA cond	PE	PPA	PE
PPA cond	PP	PPA	PP
PPA cond	PA 6	PPA	PA 6
PPA cond	PA 11	PPA	PA 11

PA cond	PA 12	PPA	PA 12	
PPA cond	PE	PPA	PP	
PPA cond	PE	PPA	PA 6	
PPA cond	PE	PPA	PA 11	
PPA cond	PE	PPA	PA 12	
PPA cond	PP	PPA	PE	
PA cond	PA 6	PPA	PE	
PA cond	PA 11	PPA	PE	
PA cond	PA 12	PPA	PE	
PPA cond	PP	PPA	PA 6	
PPA cond	PP	PPA	PA 11	
PPA cond	PP	PPA	PA 12	
PA cond	PA 6	PPA	PP	
PA cond	PA 11	PPA	PP	
PA cond	PA 12	PPA	PP	
PA cond	PA 6	PPA	PA 11	
PA cond	PA 6	PPA	PA 12	
PA cond	PA 11	PPA	PA 6	
PA cond	PA 12	PPA	PA 6	
PA cond	PA 11	PPA	PA 12	
PA cond	PA 12	PPA	PA 11	
PPA cond	PE	BA	PPA	PE
PPA cond	PP	BA	PPA	PP
PPA cond	PA 6	BA	PPA	PA 6
PPA cond	PA 11	BA	PPA	PA 11
PA cond	PA 12	BA	PPA	PA 12
PPA cond	PE	PA 6/12	PPA	PE
PPA cond	PP	PA 6/12	PPA	PP
PPA cond	PA 6	PA 6/12	PPA	PA 6
PPA cond	PA 11	PA 6/12	PPA	PA 11
PA cond	PA 12	PA 6/12	PPA	PA 12
PPA cond	PE	PPA	BA	PE
PPA cond	PP	PPA	BA	PP
PPA cond	PA 6	PPA	BA	PA 6
PPA cond	PA 11	PPA	BA	PA 11

PA cond	PA 12	PPA	BA	PA 12
PPA cond	PE	PPA	PA 6/12	PE
PPA cond	PP	PPA	PA 6/12	PP
PPA cond	PA 6	PPA	PA 6/12	PA 6
PPA cond	PA 11	PPA	PA 6/12	PA 11
PA cond	PA 12	PPA	PA 6/12	PA 12
PPA cond	PPA	PE	BA	PPA
PPA cond	PPA	PE	BA	PE
PPA cond	PPA	PP	BA	PP
PPA cond	PPA	PA 6	BA	PA 6
PPA cond	PPA	PA 11	BA	PA 11
PPA cond	PPA	PA 12	BA	PA 12
PPA cond	PPA	PE	PA 6/12	PPA
PPA cond	PPA	PE	PA 6/12	PE
PPA cond	PPA	PP	PA 6/12	PP
PPA cond	PPA	PA 6	PA 6/12	PA 6
PPA cond	PPA	PA 11	PA 6/12	PA 11
PPA cond	PPA	PA 12	PA 6/12	PA 12
PPA cond	PPA	BA	PA 6/12	PPA
PPA cond	PPA	BA	PA 6/12	PE
PPA cond	PPA	BA	PA 6/12	PP
PPA cond	PPA	BA	PA 6/12	PA 6
PPA cond	PPA	BA	PA 6/12	PA 11
PPA cond	PPA	BA	PA 6/12	PA 12
PPA cond	PE	BA	PA 6/12	PPA
PPA cond	PP	BA	PA 6/12	PPA
PPA cond	PA 6	BA	PA 6/12	PPA
PPA cond	PA 11	BA	PA 6/12	PPA
PA cond	PA 12	BA	PA 6/12	PPA
PPA cond	PPA	PA 6	PA 6/12	PPA
PPA cond	PPA	PA 6	PA 6/12	PE
PPA cond	PPA	PA 6	PA 6/12	PP
PPA cond	PPA	PA 6	PA 6/12	PA 6
PPA cond	PPA	PA 6	PA 6/12	PA 11
PPA cond	PPA	PA 6	PA 6/12	PA 12

PPA cond	PPA	PA 11	PA 6/12	BA	PPA
PPA cond	PPA	PA 11	PA 6/12	BA	PE
PPA cond	PPA	PA 11	PA 6/12	BA	PP
PPA cond	PPA	PA 11	PA 6/12	BA	PA 6
PPA cond	PPA	PA 11	PA 6/12	BA	PA 11
PPA cond	PPA	PA 11	PA 6/12	BA	PA 12
PPA cond	PPA	PA 12	PA 6/12	BA	PPA
PPA cond	PPA	PA 12	PA 6/12	BA	PE
PPA cond	PPA	PA 12	PA 6/12	BA	PP
PPA cond	PPA	PA 12	PA 6/12	BA	PA 6
PPA cond	PPA	PA 12	PA 6/12	BA	PA 11
PPA cond	PPA	PA 12	PA 6/12	BA	PA 12
PPA cond	PA 6	PPA	PA 6/12	BA	PE
PPA cond	PA 6	PPA	PA 6/12	BA	PP
PPA cond	PA 6	PPA	PA 6/12	BA	PA 6
PPA cond	PA 6	PPA	PA 6/12	BA	PA 11
PPA cond	PA 6	PPA	PA 6/12	BA	PA 12
PPA cond	PA 11	PPA	PA 6/12	BA	PE
PPA cond	PA 11	PPA	PA 6/12	BA	PP
PPA cond	PA 11	PPA	PA 6/12	BA	PA 6
PPA cond	PA 11	PPA	PA 6/12	BA	PA 11
PPA cond	PA 11	PPA	PA 6/12	BA	PA 12
PA cond	PA 12	PPA	PA 6/12	BA	PE
PA cond	PA 12	PPA	PA 6/12	BA	PP
PA cond	PA 12	PPA	PA 6/12	BA	PA 6
PA cond	PA 12	PPA	PA 6/12	BA	PA 11
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PA cond	PA 6	PA 6/12	PPA	BA	PE
PA cond	PA 6	PA 6/12	PPA	BA	PP
PA cond	PA 6	PA 6/12	PPA	BA	PA 6
PA cond	PA 6	PA 6/12	PPA	BA	PA 11
PA cond	PA 6	PA 6/12	PPA	BA	PA 12
PA cond	PA 11	PA 6/12	PPA	BA	PE
PA cond	PA 11	PA 6/12	PPA	BA	PP
PA cond	PA 11	PA 6/12	PPA	BA	PA 6

PA cond	PA 11	PA 6/12	PPA	BA	PA 11
PA cond	PA 11	PA 6/12	PPA	BA	PA 12
PA cond	PA 12	PA 6/12	PPA	BA	PE
PA cond	PA 12	PA 6/12	PPA	BA	PP
PA cond	PA 12	PA 6/12	PPA	BA	PA 6
PA cond	PA 12	PA 6/12	PPA	BA	PA 11
PA cond	PA 12	PA 6/12	PPA	BA	PA 12
PA cond	PA 6	PA 6/12	PE	BA	PPA
PA cond	PA 6	PA 6/12	PP	BA	PPA
PA cond	PA 6	PA 6/12	PA 6	BA	PPA
PA cond	PA 6	PA 6/12	PA 11	BA	PPA
PA cond	PA 6	PA 6/12	PA 12	BA	PPA
PA cond	PA 11	PA 6/12	PE	BA	PPA
PA cond	PA 11	PA 6/12	PP	BA	PPA
PA cond	PA 11	PA 6/12	PA 6	BA	PPA
PA cond	PA 11	PA 6/12	PA 11	BA	PPA
PA cond	PA 11	PA 6/12	PA 12	BA	PPA
PA cond	PA 12	PA 6/12	PE	BA	PPA
PA cond	PA 12	PA 6/12	PP	BA	PPA
PA cond	PA 12	PA 6/12	PA 6	BA	PPA
PA cond	PA 12	PA 6/12	PA 11	BA	PPA
PA cond	PA 12	PA 6/12	PA 12	BA	PPA

Patent Claims

1. Multilayer tube suitable for use in vehicles, containing
5 at least one Polyphthalamide layer.
2. Multilayer tube as per claim 1 consisting of at least
three layers, wherein the Polyphthalamide layer is a
barrier layer.
3. Multilayer tube as per claim 1 or 2, wherein the outer
10 and / or inner layer consist(s) of Polyphthalamide.
4. Multilayer tube as per claim 1 to 3, comprising at least
one layer of Polyamide, preferably selected from the
group 6,6-Polyamide, 11,11-Polyamide, 12,12-Polyamide,
Copolymer from 6,6-Polyamide and 12,12-Polyamide.
- 15 5. Multilayer tube as per claim 1 to 4, wherein at least
one Polyamide layer is a bonding agent.
6. Multilayer tube as per claim 1 to 5, containing at least
one layer of Polyethlyene or Polypropylene or a
Copolymer therof.
- 20 7. Multilayer tube as per one of the claims 1 to 6,
containing at least one layer of an adhesive or bonding
agent.
8. Multilayer tube as per one of the claims 1 to 7, wherein
25 at least one Polyphthalamide-layer or Polyamide-layer is
conductive.
9. Multilayer tube as per one of the claims 1 to 8,
containing additions of softeners, flame restraints,
anti-oxidation means or stabilizing agents.
10. Multilayer tube as per one of the claims 1 to 9,
30 selected from the group

PPA - PA 6 - PA 6/12 (bonding agent) - PA 12,

PPA - PA 6 - PA 6/12 (bonding agent) - PPA,

PPA - PA 6/12 (bonding agent) - PA 12,

PA 6 - PPA - PA 6,

5 PA 12 - PPA - PA 12,

PPA - PA 6 (bonding agent) - PPA,

PPA cond. - PPA - PA 6 (bonding agent) - PPA.

11. Multilayer tube as per one of the claims 1 to 10,
characterized in that the hydrocarbon-permission level
10 is equal or below 0,5 g/m² for a time frame of 24 h (1
d).

12. Multilayer tube as per one of the claims 1 to 11,
wherein the tube comprises an outer cover.

13. Use of a multilayer tube as per one of the claims 1 to
15 12, as fuel and vapor tube.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/010059A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B32B27/34 F16L11/04 F16L9/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B32B F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category [°]	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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